Consultation Paper No. 51

Draft CEIOPS’ Advice for Level 2 Implementing Measures on Solvency II:

SCR standard formula - Further advice on the counterparty default risk module (Complementary to CEIOPS’ Consultation Paper no. 28)

CEIOPS welcomes comments from interested parties on the following Consultation Paper.

Please send your comments to CEIOPS by email (Secretariat@ceiops.eu) by 11.09.2009 4 pm CET, indicating the reference "CEIOPS-CP-51/09".

Please note that comments submitted after the deadline or not submitted in the provided template format, cannot be processed.

CEIOPS will make all comments available on its website, except where respondents specifically request that their comments remain confidential.
1. Introduction

1.1. In its letter of 19 July 2007, the European Commission requested CEIOPS to provide final, fully consulted advice on Level 2 implementing measures by October 2009 and recommended CEIOPS to develop Level 3 guidance on certain areas to foster supervisory convergence. On 12 June 2009 the European Commission sent a letter with further guidance regarding the Solvency II project, including the list of implementing measures and timetable until implementation.

1.2. This Paper aims at providing further advice with regard to the treatment of counterparty default risk in the standard formula for the Solvency Capital Requirement as requested in Article 109 of the Level 1 text\(^1\). This consultation paper complements CEIOPS’ Consultation Paper No. 28.\(^2\)

1.3. The objective of this paper is to give draft advice on the following areas of the calculation of the capital requirement for counterparty default risk:

- The determination of the risk mitigation effect that is part of the calculation of the loss-given-default for risk mitigating contracts.
- The calibration of the parameters used in the calculation of the capital requirement.
- The determination of the probability of default of a counterparty default exposure and the definition of rating classes.
- Simplifications according to Article 109 of the Level 1 text which may be necessary to calculate the capital requirement except for simplifications which only apply to captive insurance and captive reinsurance undertakings. Advice on the captive simplifications will be given at a later stage.

1.4. CEIOPS will issue further advice on the treatment of insurance and reinsurance pools at a later stage.

---

\(^1\) Text adopted by the European Parliament on 22 April 2009.

2. Extract from Level 1 Text

Legal basis for implementing measure

Article 109 - Implementing measures

1. In order to ensure that the same treatment is applied to all insurance and reinsurance undertakings calculating the Solvency Capital Requirement on the basis of the standard formula, or to take account of market developments, the Commission shall adopt implementing measures laying down the following:

(a) a standard formula in accordance with the provisions of Articles 101 and 103 to 108;

(b) any sub-modules necessary or covering more precisely the risks which fall under the respective risk modules referred to in Article 104 as well as any subsequent updates;

(c) the methods, assumptions and standard parameters to be used, when calculating each of the risk modules or sub-modules of the Basic Solvency Capital Requirement laid down in Articles 104, 105 and 105bis, as well as the adjustment mechanism referred to in Article 105ter;

[...] (k) the simplified calculations provided for specific sub-modules and risk modules, as well as the criteria that insurance and reinsurance undertakings, including captive insurance and reinsurance undertakings, shall be required to meet in order to be entitled to use each of these simplifications, as set out in Article 108;

[...]

Other relevant articles for providing background to the advice

Article 13 - Definitions

For the purposes of this Directive, the following definitions shall apply:

[...]

(26) credit risk means the risk of loss, or of adverse change in the financial situation, resulting from fluctuations in the credit standing of issuers of securities, counterparties and any debtors to which insurance and reinsurance undertakings are exposed, in the form of counterparty default risk, or spread risk, or market risk concentrations;

[...]

Article 104 - Design of the Basic Solvency Capital Requirement

1. The Basic Solvency Capital Requirement shall comprise individual risk modules, which are aggregated in accordance with point 1 of Annex IV. It shall consist of at least the following risk modules:
(a) non-life underwriting risk;
(b) life underwriting risk;
(c) health underwriting risk;
(d) market risk,
(e) counterparty default risk.

[...]

**Article 105 - Calculation of the Basic Solvency Capital Requirement**

1. The Basic Solvency Capital Requirement shall be calculated in accordance with paragraphs 2 to 6.

6. The counterparty default risk module shall reflect possible losses due to unexpected default, or deterioration in the credit standing, of the counterparties and debtors of insurance and reinsurance undertakings over the forthcoming twelve months. The counterparty default risk module shall cover risk-mitigating contracts, such as reinsurance arrangements, securitisations and derivatives, and receivables from intermediaries, as well as any other credit exposures which are not covered in the spread risk sub-module.

   For each counterparty, the counterparty default risk module shall take account of the overall counterparty risk exposure of the insurance or reinsurance undertaking concerned to that counterparty, irrespective of the legal form of its contractual obligations to that undertaking.

**Article 108 - Simplifications in the standard formula**

Insurance and reinsurance undertakings may use a simplified calculation for a specific sub-module or risk module where the nature, scale and complexity of the risks they face justifies it and where it would be disproportionate to require all insurance and reinsurance undertakings to apply the standardised calculation.

Simplified calculations shall be calibrated in accordance with Article 101(3).
3. Advice

3.1 Explanatory text

3.1.1 Previous advice on counterparty default risk

3.1. This draft advice should be read in conjunction with CEIOPS’ earlier draft advice on the counterparty default risk module in Consultation Paper No. 28\(^3\). This draft advice complements the earlier consulted draft advice in particular areas.

3.1.2 Calculation of the loss-given-default

Definition of the loss-given-default for risk mitigating contracts

3.2. According to CP 28, the calculation of the capital requirement for counterparty default risk of type 1 exposures includes the determination of a loss-given-default for each counterparty (cf. paragraphs 3.75 to 3.89 of CP 28).

3.3. In particular, the loss-given-default for risk mitigating contracts was specified as follows in CP 28:

3.4. For a reinsurance arrangement or a securitisation, the loss-given-default \(LGD_i\) should be calculated as follows:

\[
LGD_i = \max((1 - RR_{re}) \cdot (Recoverables_i + RM_{re,i}) - Collateral_i; 0),
\]

where

\(RR_{re}\) = Recovery rate for reinsurance arrangements

\(Recoverables_i\) = Best estimate recoverables from the reinsurance contract (or SPV) \(i\) according to Article 80 of the Level 1 text plus any other debtors arising out of the reinsurance arrangement or SPV securitization

\(RM_{re,i}\) = Risk mitigating effect on underwriting risk of the reinsurance arrangement or SPV securitization \(i\)

\(Collateral_i\) = Market value of collateral in relation to the reinsurance arrangement or SPV securitization \(i\)

3.5. The risk mitigating effect \(RM_{re,i}\) is an approximation of the difference between

• the (hypothetical) capital requirement for underwriting risk under
the condition that the reinsurance arrangement or the SPV
securitization is not taken into account in its calculation

• and the capital requirement for underwriting risk (without any
amendments).

3.6. For a derivative, the loss-given-default $LGD_i$ should be calculated as
follows:

$$LGD_i = \max((1-RR_{fin}) \cdot (MarketValue_i + RM_{fin,i}) - Collateral_i; 0),$$

where

$RR_{fin} = \text{Recovery rate for derivatives}$

$MarketValue_i = \text{Value of the derivative } i \text{ according to Article 74 of the}$

$Level 1 text}$

$RM_{fin,i} = \text{Risk mitigating effect on market risk of the derivative } i$

$Collateral_i = \text{Market value of collateral in relation to the derivative } i$

3.7. The risk mitigating effect $RM_{fin,i}$ is an approximation of the difference
between

• the (hypothetical) capital requirement for market risk under the
condition that the risk mitigating effect of the derivative is not taken
into account in its calculation

• and the capital requirement for market risk (without any
amendments).

Sophisticated calculation of the risk mitigating effect

3.8. The determination of the risk mitigating effects $RM_{re,i}$ and $RM_{fin,i}$ is based
on the calculation of two capital requirements:

• The (hypothetical) capital requirement for underwriting and market
risk under the condition that the risk mitigating effect of the
reinsurance arrangement, SPV or derivative of a particular
counterparty is not taken into account in its calculation. These
values are only determined for the purpose of the counterparty
default risk module. In the QIS4 calculations, they were referred to as
capital requirements gross of the risk mitigating effect ($SCR_{life}^{\text{gross}},$

$SCR_{nl}^{\text{gross}}, SCR_{mkt}^{\text{gross}}$).

• The capital requirements for underwriting risk and market risk
without any amendments are the requirements as defined in the
Level 1 text for these modules. In the QIS4 counterparty default
risk module, they were referred to as capital requirements net of
the risk mitigating effect ($SCR_{life}^{net}$, $SCR_{nl}^{net}$, $SCR_{mkt}^{net}$). They are available as soon as the calculations of the particular modules have been made.

3.9. The gross capital requirements in relation to a counterparty (i) are determined by a recalculation of the modules which are affected by the risk mitigating contracts with that counterparty. This should be done as follows:

- If a module or sub-module is scenario-based, the scenario outcome should be reassessed assuming that the risk-mitigating contract with counterparty (i) will not provide any compensation for the losses incurred under the scenario.

- If the sub-module is factor-based, the volume measures which allow for the risk-mitigating effect of the contract need to be reassessed. In particular, the following changes need to be made in this respect:
  - In the concentration sub-module of the market risk sub-module, the exposure measures $E$ should be calculated without allowance for risk-mitigating effects of contracts with counterparty (i);
  - In the non-life premium and reserve risk sub-module, the volume measure $V$ should be calculated gross of reinsurance in relation to the counterparty (i);
  - In the non-life catastrophe sub-module a factor-based approach is applied, the calculation should disregard the reinsurance in relation to the counterparty (i), for example by using gross volume measures instead of net volume measures.\(^4\);
  - In the health premium and reserve risk sub-module, the volume measure $V$ should be calculated gross of reinsurance in relation to the counterparty (i);

3.10. In particular, if a module of the SCR did not allow for the risk mitigating effect of the risk-mitigating contract with counterparty (i) in the calculation of the net capital requirement, the net and gross capital requirements coincide and $RM_{re,i}$ and $RM_{fin,i}$ are zero.

3.11. In QIS4, However, the practicability of the calculation for risk mitigating contracts like reinsurance or derivatives was one of the main issues raised by participants (cf. section 9.5 of the CEIOPS QIS4 report). The calculation turned out to be very difficult in many cases and was considered to be disproportionate in view of the low capital charges it produced. The criticism mainly related to non-life reinsurance where the number of counterparties was often high and the calculation of the loss-

\(^4\) Factor-based approaches to non-life catastrophe risk will be defined at a later stage (see CEIOPS Consultation Paper on non-life underwriting risk (CP48/09)).
given-default was especially complex. Two reasons for the practical problems which were observed in QIS4 can be identified:

- The calculation of $SCR^{\text{gross}}$ may require a reassessment of the affected SCR module. If the module formula is complex, this assessment may be demanding.

- In principle, the calculation needs to be made separately for each independent counterparty. If the number of counterparties is high, the overall calculation may be laborious.

3.12. Simplifications in these two areas are necessary. The following paragraphs present simplifications that address the problems that were raised in QIS4. Prior to this formal consultation, these approaches were informally consulted with CEA and AMICE. In general, the appropriateness of the simplifications needs to be judged in relation to the materiality of the underlying risk. It should be noted that the low capital charges for counterparty default risk in QIS4 may not be a good indicator for the importance of this risk. Firstly, the counterparty default risk module may undergo relevant changes as described in CP 28 in order to address both the experience from QIS4 and the current financial crisis. Secondly, the amount of counterparty default risk that undertakings will be exposed to under Solvency II may change significantly. In particular, intra-group reinsurance and other intra-group relations may gain importance.

**Simplified calculation for derivatives**

3.13. In relation to financial instruments, the determination of the difference $SCR^{\text{gross}} - SCR^{\text{net}}$ was not in the focus of the complaints in QIS4. Obviously, the value $SCR^{\text{gross}}$ is straightforward to determine for a market value scenario on sub-module level. However, if many counterparties need to be assessed, the calculation may still be demanding. A simplification as follows could be introduced to mitigate the problem:

3.14. If the financial instruments of a counterparty (i) affect only one sub-module of the market risk module, then the difference $SCR^{\text{gross}}_{\text{mkt}} - SCR^{\text{net}}_{\text{mkt}}$ may be replaced by the difference $Mkt^{\text{gross}}_{\text{sub-risk}} - Mkt^{\text{net}}_{\text{sub-risk}}$ of the sub-module affected.

3.15. If the financial instruments of a counterparty (i) affect more than one sub-module, the difference $SCR^{\text{gross}}_{\text{mkt}} - SCR^{\text{net}}_{\text{mkt}}$ may be replaced by the sum of the differences $Mkt^{\text{gross}}_{\text{sub-risk}} - Mkt^{\text{net}}_{\text{sub-risk}}$ of the sub-modules affected.

3.16. Example: Let the insurer have an equity portfolio with a market value of 100. There may be a hedge in place which restricts market value losses to 20%. Given that the SCR equity shock is 32% (QIS4 calibration), on a sub-module level the gross to net difference is as follows:

$$Mkt^{\text{gross}}_{\text{eq}} - Mkt^{\text{net}}_{\text{eq}} = 32 - 20 = 12$$
3.17. The determination of this difference should be no inappropriate burden to the insurer. In most cases, the determination of the difference will be a by-product of the original $Mkt_{eq}$ calculation.

3.18. This simplification is conservative because it neglects the diversification effect between the sub-modules of the market risk module. It seems not possible to correct for this prudence in a simple way as the diversification depends on the composition of the investment portfolio and the hedging instruments in place. For example, a reduction factor for diversification could be introduced. But this factor would be difficult to calibrate and even if it was calibrated on an average level, it would distort the results in many cases.

Simplified calculation for life reinsurance

3.19. Regarding life reinsurance the situation is similar to the problems outlined above for financial instruments. Hence, a similar simplification as follows can be provided.

3.20. If the reinsurance treaties with a counterparty (i) affect only one sub-module of the life underwriting risk module, then the difference $SCR_{life}^{gross} - SCR_{life}^{net}$ may be replaced by the difference $Life_{sub-risk}^{gross} - Life_{sub-risk}^{net}$ of the sub-module affected.

3.21. If the reinsurance treaties with a counterparty (i) affect more than one sub-module of the life underwriting risk module, the difference $SCR_{life}^{gross} - SCR_{life}^{net}$ may be replaced by the sum of the differences $Life_{sub-risk}^{gross} - Life_{sub-risk}^{net}$ of the sub-modules affected.

3.22. Example: Let the capital at risk of the insurer be 1,000,000. Further, let there be stop loss reinsurance in place which covers losses above 1,000. Then the SCR for life CAT risk is 1,000 because without reinsurance the loss would be $1.5\% \times 1,000,000 = 1,500$ which exceeds the trigger point of the stop loss treaty. In this case, the gross to net difference would be

$$Life_{CAT}^{gross} - Life_{CAT}^{net} = 1,500 - 1,000 = 500$$

If the stop loss treaty has been applied in other sub-modules, the sum of the differences would be used to determine $LGD_i$ under this simplification. Again, the gross to net difference emerges in a natural way from the original SCR calculation.

3.23. For proportional life reinsurance a further simplification is possible. $SCR_{life}^{gross} - SCR_{life}^{net}$ could be determined by approximation of $SCR_{life}^{gross}$ via the gross to net ratio of the best estimate provision:

$$SCR_{life}^{gross} - SCR_{life}^{net} \approx \left( \frac{BE_{net}^{gross}}{BE_{net}^{net}} - 1 \right) \cdot SCR_{life}^{net}$$

5 The calculation is based on the QIS4 calibration of the life CAT sub-module.
where $BE^{\text{net}}$ is the best estimate provision for life insurance net of reinsurance, and $BE^{\text{gross}}$ is the best estimate provision for life insurance net of reinsurance except reinsurance towards counterparty (i).

3.24. This simplification should not be applied to non-proportional reinsurance as the risk-mitigating effect of such reinsurance arrangements are not appropriately reflected in the gross to net ratio of the best estimate.

**Simplified calculation for non-life reinsurance**

3.25. Owing to the complex formulas for non-life underwriting risk module and the high number of counterparties, the treatment of non-life reinsurance seems to have caused most problems in QIS4. The calculation can be simplified as follows:

- In a first step, calculate $SCR_{nl}^{\text{gross}} - SCR_{nl}^{\text{net}}$ for all reinsurance counterparties together.

- In a second step, approximate the share of a single counterparty (i) as follows:

$$
(SCR_{nl}^{\text{gross}} - SCR_{nl}^{\text{net}}) \approx (SCR_{nl}^{\text{gross}} - SCR_{nl}^{\text{net}}) \cdot \frac{Rec_i}{Rec_{\text{total}}},
$$

where $Rec_i$ are the reinsurance recoverables towards counterparty (i) and $Rec_{\text{total}}$ the overall reinsurance recoverables.

3.26. Another simplification was used in QIS4 (cf. page 45 in the CEIOPS’ QIS4 Questions and Answers Document). However, the underlying approximation is likely to underestimate the risk mitigating effect. A correction of this bias would add additional complexity to the approach. Moreover, the simplification only applies to the premium and reserve risk sub-module but not the CAT sub-module. Therefore, the above defined simplification seems to be more suitable.

**Implementation of the simplified calculations for derivatives and reinsurance**

3.27. There are two approaches how the simplifications defined in paragraphs 3.13 to 3.26 can be included in the standard formula:

**Option 1:** The simplifications become part of the default standard formula and replace the sophisticated calculations described in paragraphs 3.8 to 3.10.

**Option 2:** The simplifications become simplifications in terms of Article 108 of the Level 1 text and are only applied if the sophisticated calculation is disproportionate.

3.28. In case of option 2, requirements for the use of the simplifications need to be defined. It appears to be appropriate if the simplifications are only use if the following conditions are met:
• There are no indications that the simplification significantly misestimates the risk mitigating effect.

• The capital requirement for counterparty default risk under the simplified calculation is less than 20% of the overall SCR before adjustment for the loss-absorbing capacity of technical provisions and deferred taxes. For this comparison the overall SCR can be calculated by means of the simplified calculation for the counterparty default risk capital requirement.

• The result of the sophisticated calculation is not easily available.

3.29. It could be argued that under option 2 in some cases the simplification for non-life reinsurance is not sufficiently risk-sensitive while the sophisticated approach is considered to be too complex. Such a concern could be met by replacing the sophisticated calculation by a default calculation that is less complex but still more risk-sensitive than the simplification defined in paragraph 3.25. Such an approach could be defined as follows:

3.30. If the reinsurance treaties with a counterparty affect only one non-life line of business, then the difference $SCR_{nl}^{\text{gross}} - SCR_{nl}^{\text{net}}$ may be approximated by the following term:

$$
\left( NL_{\text{CAT}}^{\text{gross}} - NL_{\text{CAT}}^{\text{net}} \right)^2 + \left( 3 \cdot \sigma_{(\text{prem,lob})} \cdot (P_{\text{lob}}^{\text{gross}} - P_{\text{lob}}^{\text{net}}) \right)^2 + \left( 3 \cdot \sigma_{(\text{res,lob})} \cdot \text{recoverables} \right)^2
$$

where

- $NL_{\text{CAT}}^{\text{gross}} - NL_{\text{CAT}}^{\text{net}} = \text{Counterparty’s share of CAT losses}$
- $P_{\text{lob}}^{\text{gross}} - P_{\text{lob}}^{\text{net}} = \text{Reinsurance premium of the counterparty in the affected line of business}$
- $\text{recoverables} = \text{Reinsurance recoverables in relation to the counterparty in the affected line of business}$
- $\sigma_{(\text{prem,lob})} = \text{Standard deviation for premium risk in the affected line of business as used in the premium and reserve risk sub-module}$
- $\sigma_{(\text{res,lob})} = \text{Standard deviation for reserve risk in the affected line of business as used in the premium and reserve risk sub-module}$

3.31. If the reinsurance treaties with a counterparty affect more than one non-life line of business, the terms defined above for each line of business can be summed up to determine an approximation for $SCR_{nl}^{\text{gross}} - SCR_{nl}^{\text{net}}$. 
3.32. The formula partly neglects the diversification effect between the lines of business. The diversification effect within the lines of business is approximated in a prudent way by means of the following formula: 

\[
\sqrt{(SCR^\text{gross}_1)^2 + (SCR^\text{gross}_2)^2} - \sqrt{(SCR^\text{net}_1)^2 + (SCR^\text{net}_2)^2} 
\leq \sqrt{(SCR^\text{gross}_1 - SCR^\text{gross}_2)^2 + (SCR^\text{net}_1 - SCR^\text{net}_2)^2}
\]

Moreover, the usual linear approximation \( \rho(\sigma) \approx 3 \cdot \sigma \) of the lognormal quantile formula has been applied to derive the simplification.

3.33. By means of this simplification, a third option can be offered as follows:

**Option 3:** The default calculation is defined as in 3.8 to 3.10 except for non-life reinsurance where the approach specified in paragraphs 3.30 to 3.31 is applied. The simplifications specified in paragraphs 3.13 to 3.25 become simplifications in terms of Article 108 of the Level 1 text and are only applied if the default calculation is disproportionate.

In relation to the three options presented above, CEIOPS has a preference for option 3.

**Simplification in relation to the number of counterparties**

3.34. In principle, the calculation of the risk mitigating effect needs to be made separately for each independent counterparty. If the number of counterparties is high, the overall calculation may be laborious. In order to tackle the problem of too many calculation runs, the following simplification should be offered:

3.35. Instead of treating each counterparty (i) separately in the calculation of \( \text{LGD}_i \) and \( \text{SCR}_{\text{def}} \), the set of counterparties is divided into disjoint subsets and the calculation is modified as follows:

- In the determination of \( \text{LGD}_i \) each subset is treated as one counterparty.
- For the calculation of \( \text{SCR}_{\text{def}} \) it is necessary to assign a probability of default (or a rating) to the subset. This probability of default is the highest probability of default of the counterparties in the subset.

3.36. The simplification is always conservative. By treating several counterparties as one counterparty, the diversification effects between the counterparties are ignored. Moreover, the lowest quality counterparty

---

6 The aggregation of a vector of (sub-)module SCRs via correlation matrices defines a norm if the matrix is positive definite. In particular, the following consequence of the triangle equality holds:

\[
\text{Aggregation}(SCR^A_1, \ldots, SCR^A_n) - \text{Aggregation}(SCR^B_1, \ldots, SCR^B_n) 
\leq \text{Aggregation}(SCR^A_1 - SCR^B_1, \ldots, SCR^A_n - SCR^B_n)
\]
determines the probability of default of the subset. The degree of conservatism depends on the granularity of the subsets used as well on their homogeneity. If the subsets are smaller and the counterparties in each subset of equal credit standing, then the deviation from the sophisticated calculation is also smaller.

3.37. Another probability of default could be assigned to the subset, for example an average of the counterparties’ probability of default. This approach would be less conservative. However, such an average needs to be weighted to avoid significant distortions. For example, if a subset consists of a small exposure with a good rating and a large exposure with a bad rating an unweighted average would assign a medium rating to the overall exposure. However, it is unclear how such a rating can be defined and calculated without offsetting the simplification effect of the approach.

3.38. Examples: The simplification allows for a high degree in flexibility in the ”reduction” of counterparties. For instance, insurers could opt for one of the following realisations of the simplification:

- All counterparties with the same rating are treated as one counterparty. (This approach has already been used in QIS4.);
- All counterparties with a small exposure are treated as one counterparty;
- All counterparties with a high quality rating are treated as one counterparty.

3.39. Two concrete examples:

- Let an insurer have 10 counterparties. Nine of them are rated AAA or AA while one counterparty is rated BB. If all exposures are of similar size, the BB exposure will drive the capital charge. Therefore, it could be sufficient to treat the nine high quality counterparties as one counterparty, because the diversification effect between the nine counterparties is small compared to the capital charge for the BB exposure. The number of necessary LGD calculations is reduced from ten to two in this way.
- Let an insurer have 10 counterparties, all of them rated AA. One counterparty dominates the overall exposure. The exposures of the remaining counterparties are not very relevant. In this case, all counterparties could be treated as one counterparty, because the diversification effect between the counterparties is small compared to the exposure of the dominating counterparty. The number of necessary LGD calculations is reduced from ten to one in this way. Alternatively, two subsets could be defined: the first subset contains only the dominating counterparty and the second subset all other counterparties. Two LGD calculations would be necessary, but a large part of the diversification effect should be captured in this way.

3.40. It should be possible to use this simplification without further requirements. Undertakings should be allowed to apply this simplification
in combination with the sophisticated calculation or any of the above simplifications described in paragraphs 3.13 to 3.26.

3.1.3 Calibration

3.41. CP 28 defined a standard formula for the counterparty default risk module, but left the following parameters of the formula unspecified:

- the recovery rates $RR_{re}$ and $RR_{fin}$,
- the parameters $a$ and $\tau$ of the loss distribution for type 1 exposures,
- the quantile factor $q$ which is applied to the standard deviation of the loss distribution to estimate the 99.5% quantile,
- the risk factors $x$ and $y$ for type 2 exposures as well as the number of months $T$ which is used to define the past-due receivables of intermediaries,
- the thresholds to define when deposits with ceding institutions and called up but unpaid commitments are treated as type 1 or type 2 exposures.

Recovery rates

3.42. The recovery rates $RR_{re}$ and $RR_{fin}$ for reinsurance arrangements and derivatives should reflect a prudent estimate of the relative share of the stressed credit exposure that still can be collected in case of the default of the counterparty. (see paragraphs 3.77 and 3.80 of CP 28 for the application of these parameters in the SCR calculation.)

3.43. In QIS4, for both $RR_{re}$ and $RR_{fin}$ a value of 50% was used. This calibration was based on expert opinion because empirical data on recoverable rates of reinsurance arrangements and derivatives is rare.

3.44. There are indications that support this choice for reinsurance arrangements:

- Long-time studies of corporate bonds indicate that the QIS4 choice would reflect the recovery rate of corporate bonds.\(^7\)
- For defaulted reinsurance counterparties, an assumed recovery rate in the range of 50% seems to reflect best practice.\(^8\)

---


However, this evidence dates back from the time before the current financial crisis. One of the lessons learned from the crisis is that credit risk was generally underestimated in the past. Therefore and in absence of better evidence, CEIOPS proposes to lower the recoverable rate to 40%.

3.45. The current financial crisis has shown that banks and other issuers of derivatives can incur unprecedented losses which significantly diminish their ability to clear debt. In some cases, for example American Insurance Group Inc., the issuance of derivatives and their leverage effect was a main cause of the losses. The recovery rates observed for many banks which defaulted during the crises are relevantly lower than 50%9. For these reasons, the QIS4 calibration should be adapted. A value of 10% for the recovery rate of defaulted derivatives appears to be justified.

3.46. These calibration proposals are based on expert opinion and should therefore be considered as preliminary. Any evidence about recovery rates evolving during the current crisis should be taken into account in the final calibration.

The parameters $\alpha$ and $\tau$ of the loss distribution for type 1 exposures

3.47. In CP 28, a model for the loss distribution of type 1 exposures was proposed. The parameters $\alpha$ and $\tau$ influence the shape of this loss distribution. (See Annex A of CP 28 for a definition of $\alpha$ and $\tau$.) In order to determine the capital requirement from the loss distribution, only the variance of the distribution are used. This variance only depends on the ratio $\alpha/\tau$.

3.48. The meaning of the ratio can be illustrated by the relation between the baseline probability of default $b$, i.e. the minimum probability of default of a counterparty, for example in case of favourable economic situations, and the average default probability $p$:

$$p = \frac{\alpha}{\tau} \cdot b + 1$$

The higher the ratio $\alpha/\tau$ is, the more does the average probability default differ from the baseline probability of default. For example, if $\alpha/\tau$ is 0.5, then $p \approx 1.5 \cdot b$ and if $\alpha/\tau$ is 4, then $p \approx 5 \cdot b$.10

3.49. It can also be shown that the covariances between defaults of counterparties in the module increase with the ratio $\alpha/\tau$.

3.50. The current financial crises has shown that

---

10 For these calculations, it was assumed that $b$ is close to 0.
• the default probability of a counterparty can vary significantly over time, and
• there is a significant dependence between defaults.

3.51. Empirical data to assess the variance or covariance of reinsurance undertakings and issuers of derivatives is rare. Nevertheless, default statistics of corporate bonds indicate that volatility in market default rates is high\textsuperscript{11}. The average default probability of this kind of debt seems to be a multiple of the baseline default probability.

3.52. On this basis it appears to be reasonable to set the ratio $\frac{\alpha}{\tau}$ at 4. This calibration proposal is based on expert opinion and should therefore be considered as preliminary. Any evidence about the loss distribution evolving during the current crisis should be taken into account in the final calibration.

**The quantile factor $q$**

3.53. The model proposed in CP 28 provides a loss distribution for the counterparty default risk of the portfolio of type 1 exposures. While the shape of the distribution may be complex, the mean and the variance of the distribution can easily be calculated. The 99.5\% quantile is estimated by multiplying the standard deviation of the distribution with a quantile factor $q$. (Confer paragraph 3.75 for the application of this parameter in the SCR calculation.)

3.54. The determination of the quantile factor is not a simple task. The shape of the distribution depends both on the probability of default of the counterparties in the portfolio as well as their number. However, if it is assumed that the portfolio is sufficiently diversified or the credit quality of the counterparties is high, it appears to be appropriate to base the factor on a skewed distribution like the lognormal distribution. In this case, the quantile factor should be set at $q = 3$.

3.55. If the portfolio is dominated by one or a small number of exposures with a high probability of default, the above mentioned assumption cannot be made as the resulting distribution is considerably more skewed than the lognormal distribution. In this case, a higher quantile factor should be chosen. If the standard deviation of the loss distribution exceeds 3\% of the overall loss-given-default for type 1 exposures, the quantile factor should be set at $q = 5$. This higher quantile factor applies to portfolios with a credit quality of BBB or worse.

The risk factors for type 2 exposures

3.56. For type 2 exposures the capital requirement is calculated by multiplying the market value of the exposure with a fixed risk factor \( x \). (see paragraph 3.90 of CP 28 for the application of the parameter in the SCR calculation.)

3.57. In order to achieve consistency between the treatment of type 1 and type 2 exposures, the calibration of \( x \) could be determined by applying the approach for type 1 exposures to a model portfolio of type 2 exposures. Based on the assumptions that

- the probability of default of the type 2 counterparties corresponds to a BB rating,
- the portfolio of type 2 exposures is well diversified, and
- a third of the exposure can be collected in case of default

a risk factor of \( x = 23\% \) can be derived.\(^{12}\)

3.58. CP 28 proposed a special treatment for past-due receivables towards intermediaries in order to allow for the higher probability of default of these exposures. On a 99.5% quantile level, the collection of these receivables is very doubtful. Therefore, a risk factor of \( y = 100\% \) appears to be appropriate. It should be applied to intermediary receivables which are past-due for more than \( T = 3 \) month.

The threshold to distinguish between type 1 and type 2 exposures

3.59. According to paragraphs 3.72 to 3.73 of CP 28, the assignment of deposits with ceding institutions and called up but unpaid commitments to the classes of type 1 or type 2 exposures should depend on the number of independent counterparties. This decision was based on practicability considerations; if the number of counterparties is too large, the proposed approach for type 1 exposures becomes impracticable.

3.60. An appropriate choice for the threshold could be a number of 15 counterparties. In relation to this threshold, deposits with ceding institutions and called up but unpaid commitments should be assessed independently.

3.1.4 Probability of default for type 1 exposures

3.61. For the calculation of the capital requirement for type 1 exposures it is necessary to assign a probability of default to each counterparty. The model underlying the proposed approach for type 1 exposures recognizes that the probability of default of a particular counterparty may change over time. The probability of default that is required as input data for the calculation is a long-term average of this random variable like it is determined, for example, by credit rating agencies in their through-the-

\(^{12}\) See paragraph A.9 in Annex A.
cycle assessment. By abuse of terminology in the following mainly the term “probability of default” will be used instead of “long-term average probability of default” to ensure readability of the text.

**Determination of the probability of default via credit rating agency assessments**

3.62. In the past QIS the probability of default was mainly based on the assessment provided by credit rating agencies (CRA). An assignment of probabilities of default to external ratings was provided as part of the Technical Specifications. If a counterparty was rated the probability of default corresponding to its rating was used in the calculation of the capital requirement for counterparty default risk.

3.63. CEIOPS is aware that the use of CRA assessments has many drawbacks. CRAs operate in an oligopolistic market. Doubts have been raised whether the independence of CRA from the rated counterparties may in certain cases be impaired by conflicts of interest. The rating methodology may be inadequate and not sufficiently transparent. Changes in the credit standing of a counterparty may be declared by CRAs with delay.

3.64. According to the Proposal for a Regulation on Credit Rating Agencies of the European Commission, “it is commonly agreed that credit rating agencies contributed significantly to recent market turmoil by underestimating the credit risk of structured credit products. The great majority of subprime products were given the highest ratings, thereby clearly underestimating the major risks inherent in those instruments. Furthermore, when market conditions worsened, the agencies failed to adapt the ratings promptly.”

3.65. Despite these deficiencies, for the time being and within the scope of the standard formula, there does not seem to be an alternative way to assign a probability of default to most of the relevant counterparties than by means of credit ratings provided by CRAs.

3.66. In order to make use of credit ratings for the determination of the probability of default, two elements need to be specified:

- A recognition of the CRAs whose credit ratings can be used in the standard formula.
- For each recognised CRA, an assignment of probabilities of default to the rating classes used by the CRA. This assignment should distinguish between different kind of rated instruments and counterparties.

3.67. The credit ratings used in the standard formula should meet highest standards. Only credit ratings of CRAs which are registered according to the Regulation on Credit Rating Agencies and which meet the requirements specified in this Regulation should be recognised. Moreover, they should meet requirements which are consistent with those for

---

13 See for example, United States Securities and Exchange Commission: “Summary Report of Issues Identified in the Commission Staff’s Examinations of Select Credit Rating Agencies”, July 2008
14 See COD/2008/0217, page 2.
external credit assessment institutions included in the Capital Requirements Directive 2006/48/EC\textsuperscript{15}.

3.68. The assignment of probabilities of default to rating classes should meet the requirements specified in Directive 2006/48/EC.

3.69. The assignment described in the CRD directive is based on observed default rates. One of the consequences of the current financial crises is that the default experience may be significantly distorted by state intervention. Many counterparties in and outside of the financial sectors were saved from default by receiving capital, guarantees or other support from governments. If these counterparties were counted as not defaulted in the default statistics then the statistics would not reflect the full credit risk of these counterparties and thereby overestimate the credit quality of the credit classes they belong to. Indeed, according to such a distorted statistics the financial crisis did basically not take place and most of the past credit ratings which are criticised for having been overly optimistic were justified.

3.70. Basing the solvency assessment on a statistics with this flaw would imply that supervisors anticipate in their assessment state intervention during the next crises. Such a conclusion should be avoided. Therefore, it is important to ensure that the counterparties which would have defaulted without state intervention during the current crises are considered as defaulted for the estimation of the default probability of a rating class.

Treatment of unrated counterparties

3.71. If a counterparty is not rated by a recognised CRA, an alternative assignment of the probability of default is necessary. In QIS4, four approaches were tested in that respect:

- A look through approach for intra-group reinsurance;
- The derivation of a probability of default from the solvency ratio of the counterparty;
- The assignment of a fixed probability of default (corresponding to a BBB rating) to unrated insurance and reinsurance undertakings which are subject to Solvency II supervision;
- The assignment of a fixed probability (corresponding to a CCC rating) of default to all counterparties where non of the above approaches applied.

Look through approach

3.72. Under the look through approach the probability of default of a group-internal reinsurance counterparty is replaced by the probability of default of an external undertaking for the share of the recoverable that is retroceded to the external undertaking. In particular, in case of a 100%...\textsuperscript{15} Articles 81-83 and Annex VI, parts 2 and 3 of Directive 2006/48/EC
retrocession it is not necessary to determine the probability of default of the intra-group counterparty.

3.73. The look through approach is based on the idea that capital flows freely within the group so that the only risk relating to the retroceded business is the default of the external undertaking. A default of the internal reinsurance counterparty is considered risk-free in this respect because payments of the external undertaking to the internal reinsurance counterparty are considered as payments to the whole group.

3.74. The look through approach was justified under the condition that an effective group support ensures that the capital flows freely within the group. As the group support system is no longer envisaged for Solvency II, the look through approach has no application anymore.

**Solvency ratio rating**

3.75. An analysis of SCR and own funds appears to be a straightforward way to derive a probability of default. However, this approach has several shortcomings:

- The derivation of the default probability from the solvency ratio requires a general assumption about the loss distribution of insurance undertaking. This assumption includes a significant model error.

- As the SCR allows for one-time risk mitigating effects in the adjustment to the Basic SCR, the solvency ratio can be a bad indicator of the probability of default. If the solvency ratio of undertaking A is lower than the ratio of undertaking B then this does not imply that the probabilities of default have the same order.

- The current solvency ratio is likely to correspond to a point-in-time assessment of the undertaking’s credit standing. For the counterparty default risk module, a through-the-cycle estimate is more appropriate. In particular, under benign economic conditions a default probability estimate based on the solvency ratio may underestimate the long-term average default probability.

- The solvency ratio of a counterparty may not be known or only with delay. In case of a circular counterparty relation (for example, A is a credit counterparty of B, B is a credit counterparty of C and C is a credit counterparty of A) it may be very difficult to determine the capital requirements and solvency ratios.

3.76. Because of these shortcomings, the solvency ratio rating should only be applied with several safeguards. In particular, the derivation should take into account the significant estimation error of this approach.

3.77. According to the MCR definition in Article 127 of the Level 1 text, counterparties which do not meet the MCR have a default probability of more than 15%. To these counterparties a default probability of 30% should be assigned under the solvency ratio rating approach. Under the
proposed model, this probability produces a risk factor of 100% for the stand-alone exposure of the counterparty.

3.78. If a counterparty meets the MCR, a default probability depending on the SCR and the eligible own funds to meet the SCR (OF) could be defined as follows:

<table>
<thead>
<tr>
<th>OF/SCR</th>
<th>Probability of default</th>
</tr>
</thead>
<tbody>
<tr>
<td>&gt; 200%</td>
<td>0.025%</td>
</tr>
<tr>
<td>&gt; 175%</td>
<td>0.050%</td>
</tr>
<tr>
<td>&gt; 150%</td>
<td>0.1%</td>
</tr>
<tr>
<td>&gt; 125%</td>
<td>0.2%</td>
</tr>
<tr>
<td>&gt; 100%</td>
<td>0.5%</td>
</tr>
<tr>
<td>&gt; 90%</td>
<td>1%</td>
</tr>
<tr>
<td>&gt; 80%</td>
<td>2%</td>
</tr>
<tr>
<td>≤ 80%</td>
<td>10%</td>
</tr>
</tbody>
</table>

3.79. A derivation of this table can be found in Annex B.

3.80. The solvency ratio rating should be based on the last publicly reported figures for SCR, MCR and the eligible own funds to meet these requirements. Usually, these will be figures which are one year old. If more recent information is available to the undertaking, then they should be used. If there are indications that the current figures significantly and adversely deviate from the most recent known figures then the solvency ratio rating should not be applied. If the counterparty and the undertaking that has to assess the counterparty’s default probability belong to the same group, the current figures or, if that is not possible, the last calculated figures should be used. If the last calculates figures are not available, the solvency ratio rating should not be applied.

**Undertakings subject to Solvency II supervision**

3.81. QIS4 included the assignment of a probability of default (corresponding to a BBB rating) to unrated insurance and reinsurance undertakings which are subject to Solvency II supervision. After the implementation of Solvency II such a rule is not necessary anymore. As undertakings under Solvency II supervision have to publish their SCR and eligible own funds, the solvency ratio rating can be derived for them. Moreover, the QIS4 approach is not appropriate for supervised counterparties which do not meet the SCR.

**Treatment of counterparties without a solvency ratio rating**

3.82. As in QIS4 it will be necessary to define a treatment of those counterparties for which no default probability can be assigned by one of the appropriate approaches specified above. These counterparties are defined as follows: they are not rated by a recognised CRA and no solvency ratio rating can be assigned to them, either because they are
not under Solvency II supervision or they do not meet the requirement of the solvency ratio rating.

3.83. To these counterparties, a probability of default of 10% should be assigned. This corresponds to a credit rating between B and CCC according to the S&P classification.

**Counterparties which belong to the same group**

3.84. If an undertaking has more than several counterparty which are not independent (for example because they belong to the same group, cf. paragraph 3.86 of CP 28) then it is necessary to assign a probability of default to the whole set of dependent counterparties. This overall probability of default should be average probability of the counterparties weighted with the corresponding losses-given-default.

**Equivalent supervision**

3.85. In relation to the determination of the probability of default, the scope of this advice does not include the treatment of counterparties under supervision equivalent to Solvency II.

**Pools**

3.86. CEIOPS will issue further advice on the treatment of insurance and reinsurance pools at a later stage.
3.2 CEIOPS’ advice

3.2.1 Previous advice on counterparty default risk

3.87. This draft advice should be read in conjunction with CEIOPS’ earlier draft advice on the counterparty default risk module in Consultation Paper No. 28 (Draft CEIOPS’ Advice for Level 2 Implementing Measures on Solvency II: SCR standard formula - Advice on the counterparty default risk module). This draft advice complements the earlier consulted draft advice in particular areas.

3.2.2 Calculation of the loss-given-default

Sophisticated calculation of the risk mitigating effect

3.88. The determination of the risk mitigating effects $RM_{re,i}$ for reinsurance arrangements and SPV and $RM_{fin,i}$ for derivatives should be based on the calculation of two capital requirements:

- The (hypothetical) capital requirement for underwriting and market risk under the condition that the risk mitigating effect of the reinsurance arrangement, SPV or derivative of a particular counterparty is not taken into account in its calculation ($SCR_{life}^{gross}$, $SCR_{nl}^{gross}$, $SCR_{mkt}^{gross}$).

- The capital requirements for underwriting risk and market risk without any amendments are the requirements as defined in the Level 1 text for these modules ($SCR_{life}^{net}$, $SCR_{nl}^{net}$, $SCR_{mkt}^{net}$).

3.89. The gross capital requirements in relation to a counterparty (i) should be determined by a recalculation of the modules which are affected by the risk mitigating contracts with that counterparty. This should be done as follows:

- If a module or sub-module is scenario-based, the scenario outcome should be reassessed assuming that the risk-mitigating contract with counterparty (i) will not provide any compensation for the losses incurred under the scenario.

- If the sub-module is factor-based, the volume measures which allow for the risk-mitigating effect of the contract need to be reassessed. In particular, the following changes need to be made in this respect:
  - In the concentration sub-module of the market risk sub-module, the exposure measures $E$ should be calculated without allowance for risk-mitigating effects of contracts with counterparty (i).
In the non-life premium and reserve risk sub-module, the volume measure $V$ should be calculated gross of reinsurance in relation to the counterparty (i).

In the non-life catastrophe sub-module a factor-based approach is applied, the calculation should disregard the reinsurance in relation to the counterparty (i), for example by using gross volume measures instead of net volume measures.

In the health premium and reserve risk sub-module, the volume measure $V$ should be calculated gross of reinsurance in relation to the counterparty (i).

3.90. In particular, if a module of the SCR did not allow for the risk mitigating effect of the risk-mitigating contract with counterparty (i) in the calculation of the net capital requirement, the net and gross capital requirements coincide and $RM_{i,\text{fin}}$ and $RM_{i,\text{fin}}$ are zero.

**Simplified calculation for derivatives**

3.91. The calculation of the risk mitigating effect for life reinsurance can be simplified as follows:

3.92. If the financial instruments of a counterparty (i) affect only one sub-module of the market risk module, then the difference $SCR_{\text{mkt}}^{\text{gros}} - SCR_{\text{mkt}}^{\text{net}}$ may be replaced by the difference $Mkt_{\text{sub-risk}}^{\text{gros}} - Mkt_{\text{sub-risk}}^{\text{net}}$ of the sub-module affected.

3.93. If the financial instruments of a counterparty (i) affect more than one sub-module, the difference $SCR_{\text{mkt}}^{\text{gros}} - SCR_{\text{mkt}}^{\text{net}}$ may be replaced by the sum of the differences $Mkt_{\text{sub-risk}}^{\text{gros}} - Mkt_{\text{sub-risk}}^{\text{net}}$ of the sub-modules affected.

**Simplified calculation for life reinsurance**

3.94. The calculation of the risk mitigating effect for life reinsurance can be simplified as follows:

3.95. If the reinsurance treaties with a counterparty (i) affect only one sub-module of the life underwriting risk module, then the difference $SCR_{\text{life}}^{\text{gros}} - SCR_{\text{life}}^{\text{net}}$ may be replaced by the difference $Life_{\text{sub-risk}}^{\text{gros}} - Life_{\text{sub-risk}}^{\text{net}}$ of the sub-module affected.

3.96. If the reinsurance treaties with a counterparty (i) affect more than one sub-module of the life underwriting risk module, the difference $SCR_{\text{life}}^{\text{gros}} - SCR_{\text{life}}^{\text{net}}$ may be replaced by the sum of the differences $Life_{\text{sub-risk}}^{\text{gros}} - Life_{\text{sub-risk}}^{\text{net}}$ of the sub-modules affected.

3.97. For proportional life reinsurance a further simplification is possible:
$$SCR_{\text{life}}^{\text{net}} - SCR_{\text{life}}^{\text{gross}} \approx \left( \frac{BE_{\text{net}}^{\text{gross}}}{BE_{\text{net}}^{\text{net}}} - 1 \right) \cdot SCR_{\text{life}}^{\text{net}},$$

where $BE_{\text{net}}^{\text{net}}$ is the best estimate provision for life insurance net of reinsurance, and $BE_{\text{net}}^{\text{gross}}$ is the best estimate provision for life insurance net of reinsurance except reinsurance towards counterparty (i).

Simplified calculation for non-life reinsurance

3.98. The calculation of the risk mitigating effect for non-life reinsurance can be simplified as follows:

- In a first step, calculate $SCR_{\text{nl}}^{\text{gross}} - SCR_{\text{nl}}^{\text{net}}$ for all reinsurance counterparties together.
- In a second step, approximate the share of a single counterparty (i) as follows:

$$\left( SCR_{\text{nl}}^{\text{gross}} - SCR_{\text{nl}}^{\text{net}} \right)_{i} \approx \left( SCR_{\text{nl}}^{\text{gross}} - SCR_{\text{nl}}^{\text{net}} \right) \cdot \frac{\text{Rec}_{i}}{\text{Rec}_{\text{total}}},$$

where $\text{Rec}_{i}$ are the reinsurance recoverables towards counterparty (i) and $\text{Rec}_{\text{total}}$ the overall reinsurance recoverables.

Implementation of the simplified calculations for derivatives and reinsurance

3.99. There are three approaches how the simplifications defined in paragraphs 3.91 to 3.98 can be included in the standard formula:

Option 1: The simplifications become part of the default standard formula and replace the sophisticated calculations described in paragraphs 3.88 to 3.90.

Option 2: The simplifications become simplifications in terms of Article 108 of the Level 1 text and are only applied if the sophisticated calculation is disproportionate.

Option 3: The default calculation is defined as in paragraphs 3.88 to 3.90 except for non-life reinsurance where the approach specified in paragraphs 3.30 to 3.31 is applied. The simplifications specified in paragraphs 3.91 to 3.98 become simplifications in terms of Article 108 of the Level 1 text and are only applied if the default calculation is disproportionate.

CEIOPS has a preference for option 3.

3.100. In case of option 2 and option 3, the simplifications should only be used if the following conditions are met:

- There are no indications that the simplification significantly misestimates the risk mitigating effect.
• The capital requirement for counterparty default risk under the simplified calculation is less than 20% of the overall SCR before adjustment for the loss-absorbing capacity of technical provisions and deferred taxes. For this comparison the overall SCR can be calculated by means of the simplified calculation for the counterparty default risk capital requirement.

• The result of the sophisticated calculation is not easily available.

3.101. The Level 2 Implementing Measures should only include one of the three options presented above. CEIOPS welcomes stakeholder feedback on the options to support its final advice.

Simplification in relation to the number of counterparties

3.102. In order to reduce the number of calculations of risk mitigating effects, the following simplification should be offered:

3.103. Instead of treating each counterparty (i) separately in the calculation of \( LGD_i \) and \( SCR_{def} \), the set of counterparties is divided into disjoint subsets and the calculation is modified as follows:

- In the determination of \( LGD_i \), each subset is treated as one counterparty.

- For the calculation of \( SCR_{def} \), it is necessary to assign a probability of default (or a rating) to the subset. This probability of default is the highest probability of default of the counterparties in the subset.

3.104. It should be possible to use this simplification without further requirements. Undertakings should be allowed to apply this simplification in combination with the sophisticated calculation or any of the above simplifications described in paragraphs 3.91 to 3.98.

3.2.3 Calibration

Recovery rate

3.105. The recovery rates \( RR_{re} \) and \( RR_{fin} \) for reinsurance arrangements and derivatives should reflect a prudent estimate of the relative share of the stressed credit exposure that still can be collected in case of the default of the counterparty.

3.106. They should be set at \( RR_{re} = 40\% \) and \( RR_{fin} = 10\% \).

The parameters \( \alpha \) and \( \tau \) of the loss distribution for type 1 exposures

3.107. The ratio \( \alpha/\tau \) should properly reflect the volatility in the probability of default of reinsurers and issuers of derivatives as well as the dependence between the defaults of such counterparties.

3.108. The ratio should be set at \( \alpha/\tau = 4 \).
The quantile factor $q$

3.109. The quantile factor should be set as follows:

$$q = \begin{cases} 3 & \text{if } \sqrt{V} \leq 3\% \cdot \sum_i LGD_i \\ 5 & \text{else} \end{cases}$$

The risk factors for type 2 exposures

3.110. The risk factors for type 2 exposures should be chosen consistently with the model for type 1 exposures.

3.111. The risk factor for intermediary receivable which are past-due for more than $T = 3$ months should be set at $y = 100\%$. For all other type 2 exposures a risk factor $x = 23\%$ should be chosen.

The threshold to distinguish between type 1 and type 2 exposures

3.112. If the number of independent counterparties in relation to deposits with ceding institutions does not exceed 15, these exposures should be treated as type 1 exposures. The same should apply to called up but unpaid commitments.

3.2.4 Probability of default for type 1 exposures

3.113. The assignment of a probability of default should follow three steps as follows:

- If the counterparty is rated by a credit rating agency (CRA) which meets certain quality requirements, the credit rating should be used to derive a probability of default.

- Otherwise, if the counterparty is an insurance or reinsurance undertaking that is subject to Solvency II supervision and up-to-date information about the solvency position of the undertaking are available, then the probability of default should be derived by means of a solvency ratio rating.

- Otherwise the probability of default should be a fixed figure.

Counterparties rated by CRA

3.114. In order to make use of credit ratings for the determination of the probability of default two elements should to be specified:

- Recognition of the CRAs whose credit ratings can be used in the standard formula.

- For each recognised CRA, an assignment of probabilities of default to the rating classes used by the CRA. This assignment should distinguish between different kind of rated instruments and
counterparties.

3.115. The credit ratings used in the standard formula should meet highest standards. Only credit ratings of CRAs which are registered according to the Regulation on Credit Rating Agencies and which meet the requirements specified in this Regulation should be recognised. Moreover, they should meet requirements which are consistent with those for external credit assessment institutions included in the Capital Requirements Directive 2006/48/EC.

3.116. The assignment of probabilities of default to rating classes should meet the requirements specified in Directive 2006/48/EC.

3.117. In order to avoid a distortion of the default experience underlying this assessment, counterparties which would have defaulted without state intervention during the current crises should be considered as defaulted for the estimation of the default probability of a rating class.

**Solvency ratio rating**

3.118. If the counterparty is an insurance or reinsurance undertaking that is subject to Solvency II supervision and not rated by a recognised CRA, then the probability of default of the counterparty should be derived by means of a solvency ratio rating as follows.

3.119. To counterparties which do not meet the MCR, a default probability of 30% should be assigned.

3.120. If a counterparty meets the MCR, a default probability depending on the SCR and the eligible own funds to meet the SCR (OF) could be defined as follows:

<table>
<thead>
<tr>
<th>OF/SCR</th>
<th>Probability of default</th>
</tr>
</thead>
<tbody>
<tr>
<td>&gt; 200%</td>
<td>0.025%</td>
</tr>
<tr>
<td>&gt; 175%</td>
<td>0.050%</td>
</tr>
<tr>
<td>&gt; 150%</td>
<td>0.1%</td>
</tr>
<tr>
<td>&gt; 125%</td>
<td>0.2%</td>
</tr>
<tr>
<td>&gt; 100%</td>
<td>0.5%</td>
</tr>
<tr>
<td>&gt; 90%</td>
<td>1%</td>
</tr>
<tr>
<td>&gt; 80%</td>
<td>2%</td>
</tr>
<tr>
<td>≤ 80%</td>
<td>10%</td>
</tr>
</tbody>
</table>

3.121. The solvency ratio rating should be based on the last publicly reported figures for SCR, MCR and the eligible own funds to meet these requirements. Usually, these will be figures which are one year old. If more recent information is available to the undertaking, then they should be used. If there are indications that the current figures significantly and adversely deviate from the most recent known figures, then the solvency ratio rating should not be applied. If the counterparty and the undertaking
that has to assess the counterparty’s default probability belong to the same group, the current figures or, if that is not possible, the last calculated figures should be used. If the last calculates figures are not available, the solvency ratio rating should not be applied.

Counterparties without a CRA credit rating and a solvency ratio rating

3.122.A probability of default of 10% should be assigned to counterparties which are not rated by a recognised CRA and no solvency ratio rating can be assigned to them, either because they are not under Solvency II supervision or they do not meet the requirement of the solvency ratio rating.

Counterparties which belong to the same group

3.123.If an undertaking has more than several counterparty which are not independent (for example because they belong to one group, cf. paragraph 3.86 of CP 28) then it is necessary to assign a probability of default to the whole set of dependent counterparties. This overall probability of default should be average probability of the counterparties weighted with the corresponding losses-given-default.

Equivalent supervision

3.124.In relation to the determination of the probability of default, the scope of this advice does not include the treatment of counterparties under supervision equivalent to Solvency II.
Annex A

Comparison of risk factors according to the proposed approach and the QIS4 approach

Introduction

A.1. The following tables display the capital requirements of exemplary type 1 exposures according to the approach proposed in this consultation paper and the QIS4 approach.

A.2. In the tables, the capital requirements are standardised with the sum of losses-given-defaults (LGD), i.e. shown are the ratios of capital requirements and the sum of LGDs.

A.3. The probabilities of default of the exposures are denoted with the rating classes used in QIS4 Technical Specifications (cf. TS.X.A.9). This is not meant to be part of CEIOPS’ advice on the assignment of default probabilities to counterparties. Rather, this approach was chosen to make the results of the proposed approach comparable to the results of the QIS4 approach.

A.4. As can be seen below, compared to QIS4 the proposed approach leads to a significant increase of the risk factors for counterparties rated AAA or AA. This stems, inter alia, from the fact that the model underlying the calculation recognizes that probability of defaults are not constant over time but increase in times of systemic stress. This feature of the model is in line with best practice of credit risk modelling. A justification for this approach as well its quantitative outcome can also be found in the observations made during the current financial crisis where several banks with a high rating defaulted or had to be bailed out by governments.

The case of a single counterparty

A.5. In this case all type 1 exposures relate to one counterparty. Depending on the rating class of the counterparty requirements as follows can be derived:

<table>
<thead>
<tr>
<th></th>
<th>Proposed approach SCR in % of LGD</th>
<th>QIS4 approach SCR in % of LGD</th>
</tr>
</thead>
<tbody>
<tr>
<td>AAA</td>
<td>1.3%</td>
<td>0.2%</td>
</tr>
<tr>
<td>AA</td>
<td>3.0%</td>
<td>1.0%</td>
</tr>
<tr>
<td>A</td>
<td>6.7%</td>
<td>5.0%</td>
</tr>
<tr>
<td>BBB</td>
<td>24.5%</td>
<td>24.0%</td>
</tr>
<tr>
<td>BB</td>
<td>54.5%</td>
<td>100.0%</td>
</tr>
<tr>
<td>B</td>
<td>100.0%</td>
<td>100.0%</td>
</tr>
<tr>
<td>CCC</td>
<td>100.0%</td>
<td>100.0%</td>
</tr>
</tbody>
</table>
A.6. Remarks on the table:

- The QIS4 approach does not apply the Vasicek-Herfindahl calculus to the case of a single exposure. Instead, the risk factor is just equal to $\min(100\%; 100 \cdot \text{Probability of default})$.

- Under the proposed approach, the capital requirement for the CCC rating is capped.

**The case of two counterparties**

A.7. In this case the type 1 exposures relate to two independent counterparties. The losses-given-default of both counterparties are assumed to be equal. Depending on the rating class of the two counterparties, capital requirements (in % of the sum of LGDs) can be derived:

<table>
<thead>
<tr>
<th>Proposed approach</th>
<th>AAA</th>
<th>AA</th>
<th>A</th>
<th>BBB</th>
<th>BB</th>
<th>B</th>
<th>CCC</th>
</tr>
</thead>
<tbody>
<tr>
<td>AAA</td>
<td>1.1%</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>AA</td>
<td>1.8%</td>
<td>2.5</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>A</td>
<td>3.5%</td>
<td>4.1%</td>
<td>5.6</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>BBB</td>
<td>7.4%</td>
<td>7.7%</td>
<td>8.9%</td>
<td>20.5%</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>BB</td>
<td>27.3%</td>
<td>27.5%</td>
<td>28.7%</td>
<td>33.0%</td>
<td>45.5%</td>
<td></td>
<td></td>
</tr>
<tr>
<td>B</td>
<td>59.5%</td>
<td>59.7%</td>
<td>60.2%</td>
<td>62.5%</td>
<td>72.3%</td>
<td>99.2%</td>
<td></td>
</tr>
<tr>
<td>CCC</td>
<td>100.0%</td>
<td>100.0%</td>
<td>100.0%</td>
<td>100.0%</td>
<td>100.0%</td>
<td>100.0%</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>QIS4 approach</th>
<th>AAA</th>
<th>AA</th>
<th>A</th>
<th>BBB</th>
<th>BB</th>
<th>B</th>
<th>CCC</th>
</tr>
</thead>
<tbody>
<tr>
<td>AAA</td>
<td>0.01%</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>AA</td>
<td>0.1%</td>
<td>0.1%</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>A</td>
<td>0.9%</td>
<td>0.9%</td>
<td>1.7%</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>BBB</td>
<td>6.0%</td>
<td>6.0%</td>
<td>6.8%</td>
<td>11.9%</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>BB</td>
<td>24.0%</td>
<td>24.0%</td>
<td>24.8%</td>
<td>29.9%</td>
<td>47.9%</td>
<td></td>
<td></td>
</tr>
<tr>
<td>B</td>
<td>45.6%</td>
<td>45.7%</td>
<td>46.5%</td>
<td>51.6%</td>
<td>69.6%</td>
<td>91.3%</td>
<td></td>
</tr>
<tr>
<td>CCC</td>
<td>50.0%</td>
<td>50.1%</td>
<td>50.8%</td>
<td>55.9%</td>
<td>73.9%</td>
<td>95.6%</td>
<td>100.0%</td>
</tr>
</tbody>
</table>

A.8. Remark on the table:

It can be observed that in the case of CCC exposures the risk factors for the combinations with AAA to BB exposures are not consistent, because they imply a higher capital requirement for the combination than for the two stand-alone exposures. This effect also affects (to a much lesser degree) B exposures. It is a spill-over effect. The risk factors for CCC and B exposures are cut at 100% (cf. paragraph 3.75 of CP 28). Without this limitation the risk factors for B and CCC exposures would be 119% and 230% respectively. The ceiling to the risk factors only applies effectively
to the overall exposures but not its components. This inconsistency relates only to a limited number of cases and may not be relevant in practice as undertakings should not have significant exposures to counterparties rated B or CCC.

On the other hand, if the effect was considered material it could be removed by limiting the probabilities of default that feed into the calculation instead of the risk factor. If a ceiling of 4.175% is applied to the probabilities of default then the inconsistency disappears. With the proposed calibration, the 4.175% probability corresponds to a risk factor of 100% for a stand-alone exposure. This ceiling would apply both to CCC and B exposures the resulting risk factors are as follows:

<table>
<thead>
<tr>
<th></th>
<th>AAA</th>
<th>AA</th>
<th>A</th>
<th>BBB</th>
<th>BB</th>
<th>B</th>
<th>B/CCC</th>
</tr>
</thead>
<tbody>
<tr>
<td>B/CCC</td>
<td>50.04%</td>
<td>50.2%</td>
<td>50.8%</td>
<td>53.5%</td>
<td>64.3%</td>
<td>83.4%</td>
<td></td>
</tr>
</tbody>
</table>

*Diversification within a rating class*

A.9. In this case the type 1 exposure relates to counterparties which all belong to the same rating class. The losses-given-default of all these counterparties are assumed to be equal. Depending on the number and rating class of the counterparties, capital requirements (in % of the sum of LGDs) can be derived:

**Proposed approach**

<table>
<thead>
<tr>
<th></th>
<th>AAA</th>
<th>AA</th>
<th>A</th>
<th>BBB</th>
<th>BB</th>
<th>B</th>
<th>CCC</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>1.3%</td>
<td>3.0%</td>
<td>6.7%</td>
<td>24.5%</td>
<td>54.5%</td>
<td>100.0%</td>
<td>100.0%</td>
</tr>
<tr>
<td>2</td>
<td>1.1%</td>
<td>2.5%</td>
<td>5.6%</td>
<td>20.5%</td>
<td>45.5%</td>
<td>99.2%</td>
<td>100.0%</td>
</tr>
<tr>
<td>3</td>
<td>1.0%</td>
<td>2.3%</td>
<td>5.2%</td>
<td>19.0%</td>
<td>42.2%</td>
<td>91.5%</td>
<td>100.0%</td>
</tr>
<tr>
<td>4</td>
<td>1.0%</td>
<td>2.2%</td>
<td>5.0%</td>
<td>18.2%</td>
<td>40.3%</td>
<td>87.5%</td>
<td>100.0%</td>
</tr>
<tr>
<td>5</td>
<td>1.0%</td>
<td>2.2%</td>
<td>4.8%</td>
<td>17.7%</td>
<td>39.2%</td>
<td>84.8%</td>
<td>100.0%</td>
</tr>
<tr>
<td>6</td>
<td>0.9%</td>
<td>2.1%</td>
<td>4.7%</td>
<td>17.3%</td>
<td>38.3%</td>
<td>83.1%</td>
<td>100.0%</td>
</tr>
<tr>
<td>...</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>10</td>
<td>0.9%</td>
<td>2.0%</td>
<td>4.5%</td>
<td>16.7%</td>
<td>36.8%</td>
<td>79.7%</td>
<td>100.0%</td>
</tr>
<tr>
<td>...</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>100</td>
<td>0.9%</td>
<td>1.9%</td>
<td>4.3%</td>
<td>15.5%</td>
<td>34.5%</td>
<td>74.5%</td>
<td>100.0%</td>
</tr>
</tbody>
</table>

**QIS4 approach**

<table>
<thead>
<tr>
<th></th>
<th>AAA</th>
<th>AA</th>
<th>A</th>
<th>BBB</th>
<th>BB</th>
<th>B</th>
<th>CCC</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>0.200%</td>
<td>1.00%</td>
<td>5.0%</td>
<td>24.0%</td>
<td>100.0%</td>
<td>100.0%</td>
<td>100.0%</td>
</tr>
<tr>
<td>2</td>
<td>0.009%</td>
<td>0.15%</td>
<td>1.7%</td>
<td>11.9%</td>
<td>47.9%</td>
<td>91.3%</td>
<td>100.0%</td>
</tr>
<tr>
<td>3</td>
<td>0.026%</td>
<td>0.26%</td>
<td>2.0%</td>
<td>10.7%</td>
<td>39.5%</td>
<td>83.0%</td>
<td>99.7%</td>
</tr>
<tr>
<td>4</td>
<td>0.036%</td>
<td>0.30%</td>
<td>2.0%</td>
<td>10.0%</td>
<td>35.9%</td>
<td>78.6%</td>
<td>99.4%</td>
</tr>
<tr>
<td>5</td>
<td>0.042%</td>
<td>0.32%</td>
<td>2.0%</td>
<td>9.6%</td>
<td>33.9%</td>
<td>75.9%</td>
<td>99.0%</td>
</tr>
<tr>
<td>6</td>
<td>0.046%</td>
<td>0.33%</td>
<td>2.0%</td>
<td>9.3%</td>
<td>32.8%</td>
<td>74.0%</td>
<td>98.8%</td>
</tr>
<tr>
<td>...</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>10</td>
<td>0.053%</td>
<td>0.35%</td>
<td>2.0%</td>
<td>8.7%</td>
<td>30.3%</td>
<td>70.4%</td>
<td>98.1%</td>
</tr>
<tr>
<td>...</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>100</td>
<td>0.061%</td>
<td>0.36%</td>
<td>1.9%</td>
<td>8.0%</td>
<td>27.2%</td>
<td>65.4%</td>
<td>96.9%</td>
</tr>
</tbody>
</table>
A.10. Under the proposed approach the diversification effect between counterparties in the same rating class is defined in terms of a simple formula as follows:

A.11. Within the same rating class a reinsurance bouquet with Herfindahl index\textsuperscript{16} denoted as $H$ and equicorrelation between reinsurers as $\rho$, implies a reduction factor of the standard deviation as compared to a fully concentrated bouquet given by $\sqrt{H + (1 - H)\rho}$. This ratio declines from the value 1 for $H=1$ to $\sqrt{\rho}$ for $H=0$.

A.12. The equicorrelation is given by $\rho = \frac{\alpha (1 - p)}{\alpha (2 - p) + 2 \tau} = \frac{2 - 2p}{5 - 2p}$

A.13. If the ceiling to the probability of default defined in paragraph A.8 is applied, the results for B and CCC exposures are as follows:

<table>
<thead>
<tr>
<th>B/CCC</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>100%</td>
</tr>
<tr>
<td>2</td>
<td>83%</td>
</tr>
<tr>
<td>3</td>
<td>77%</td>
</tr>
<tr>
<td>4</td>
<td>74%</td>
</tr>
<tr>
<td>5</td>
<td>72%</td>
</tr>
<tr>
<td>6</td>
<td>70%</td>
</tr>
<tr>
<td>10</td>
<td>67%</td>
</tr>
<tr>
<td>100</td>
<td>63%</td>
</tr>
</tbody>
</table>

\textsuperscript{16} Let there be $k$ reinsurers with the same rating class and reinsurance bouquet described by a column vector $y$ containing the $k$ loss-given-default values. The Herfindahl index of this bouquet is given by:

$$H = \frac{y'y}{(y'\tau)}$$

which takes on values between 1 and $1/k$. 

34/36
Annex B

Derivation of a solvency ratio rating

B.1. For the purpose of the solvency ratio rating for undertakings that meet the MCR, the probability of default (PD) of an undertaking can be defined as the probability that eligible own funds to meet the SCR become negative during the following year. Hence,

\[ PD = P(OF - X \leq 0), \]

where OF are the current eligible own funds and X is the random variable describing the reduction of basic own funds during the following year.

B.2. Because of

\[ \text{VaR}_{0.995}(X) = \text{VaR}_{1-PD}(X), \]

a relation between PD and the solvency ratio \( OF/SCR \) can be established as follows:

\[ \frac{OF}{SCR} = \frac{\text{VaR}_{1-PD}(X)}{\text{VaR}_{0.995}(X)} \]

B.3. In order to properly allow for risk mitigation effects which are limited and do not linearly increase with the risk (like the mitigating effects of discretionary benefits or deferred taxes), the solvency ratio should be adjusted as follows: instead of applying the ratio \( OF/SCR \) a modified solvency ratio

\[ SR^* = \frac{OF + 50\% \cdot SCR}{SCR + 50\% \cdot SCR} \]

could be used.

This modification corresponds to the assumption that a third of the risk is mitigated by effects which do not increase linearly with the risk. Without the mitigating effect the risk is 50% higher. The mitigating effects are taken into account in the numerator to reflect their limited ability to reduce risk. (They resemble own funds in the characteristics that they are used up once they have absorbed losses.) The modification should only be applied to solvency ratios above 100%. The effect of this adjustment can be seen in the table in paragraph B.6.

B.4. It is necessary to make assumptions on the distribution of X in order to evaluate this relation. Owing to the homogeneity of VaR, the distribution needs only to be known up to a scaling factor. Moreover, only the tail of the distribution is relevant.
B.5. A usual assumption about reinsured business is that the tail of its distribution follows a Pareto distribution. For the compound distribution function \( F(x) = 1 - x^{-\alpha}, x \geq 1 \), the following relation can be derived:

\[
PD = \left( \frac{SR^*}{\alpha} \right)^{-\alpha} \cdot 0.5\%.
\]

B.6. The following table shows the default probabilities depending on the solvency ratio for different choices of the parameter \( \alpha \) of the Pareto distribution.

<table>
<thead>
<tr>
<th>OF/SCR</th>
<th>SR*</th>
<th>PD ( \alpha = 5 )</th>
<th>PD ( \alpha = 6 )</th>
<th>PD ( \alpha = 7 )</th>
</tr>
</thead>
<tbody>
<tr>
<td>200%</td>
<td>167%</td>
<td>0.039%</td>
<td>0.023%</td>
<td>0.014%</td>
</tr>
<tr>
<td>190%</td>
<td>160%</td>
<td>0.048%</td>
<td>0.030%</td>
<td>0.019%</td>
</tr>
<tr>
<td>180%</td>
<td>153%</td>
<td>0.059%</td>
<td>0.038%</td>
<td>0.025%</td>
</tr>
<tr>
<td>170%</td>
<td>147%</td>
<td>0.074%</td>
<td>0.050%</td>
<td>0.034%</td>
</tr>
<tr>
<td>160%</td>
<td>140%</td>
<td>0.093%</td>
<td>0.066%</td>
<td>0.047%</td>
</tr>
<tr>
<td>150%</td>
<td>133%</td>
<td>0.119%</td>
<td>0.089%</td>
<td>0.067%</td>
</tr>
<tr>
<td>140%</td>
<td>127%</td>
<td>0.153%</td>
<td>0.121%</td>
<td>0.096%</td>
</tr>
<tr>
<td>130%</td>
<td>120%</td>
<td>0.201%</td>
<td>0.167%</td>
<td>0.140%</td>
</tr>
<tr>
<td>120%</td>
<td>113%</td>
<td>0.267%</td>
<td>0.236%</td>
<td>0.208%</td>
</tr>
<tr>
<td>110%</td>
<td>107%</td>
<td>0.362%</td>
<td>0.339%</td>
<td>0.318%</td>
</tr>
<tr>
<td>100%</td>
<td>100%</td>
<td>0.500%</td>
<td>0.500%</td>
<td>0.500%</td>
</tr>
<tr>
<td>90%</td>
<td>90%</td>
<td>0.847%</td>
<td>0.941%</td>
<td>1.045%</td>
</tr>
<tr>
<td>80%</td>
<td>80%</td>
<td>1.526%</td>
<td>1.907%</td>
<td>2.384%</td>
</tr>
<tr>
<td>70%</td>
<td>70%</td>
<td>2.975%</td>
<td>4.250%</td>
<td>6.071%</td>
</tr>
<tr>
<td>60%</td>
<td>60%</td>
<td>6.430%</td>
<td>10.717%</td>
<td>17.861%</td>
</tr>
<tr>
<td>50%</td>
<td>50%</td>
<td>16.000%</td>
<td>32.000%</td>
<td>64.000%</td>
</tr>
</tbody>
</table>

B.7. If the parameter \( \alpha = 6 \) is chosen, a solvency ratio rating could be defined as follows:

<table>
<thead>
<tr>
<th>OF/SCR</th>
<th>Probability of default</th>
</tr>
</thead>
<tbody>
<tr>
<td>&gt; 200%</td>
<td>0.025%</td>
</tr>
<tr>
<td>&gt; 175%</td>
<td>0.050%</td>
</tr>
<tr>
<td>&gt; 150%</td>
<td>0.1%</td>
</tr>
<tr>
<td>&gt; 125%</td>
<td>0.2%</td>
</tr>
<tr>
<td>&gt; 100%</td>
<td>0.5%</td>
</tr>
<tr>
<td>&gt; 90%</td>
<td>1%</td>
</tr>
<tr>
<td>&gt; 80%</td>
<td>2%</td>
</tr>
<tr>
<td>( \leq ) 80%</td>
<td>10%</td>
</tr>
</tbody>
</table>